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The impact of learning design on student learning in technology integrated lessons

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Abstract

The purpose of this paper is to investigate the impact of learning design on knowledge transfer in technology integrated lessons where limited technologies are available to students in a third world country. This article includes an evaluation of the learning designs of technology integrated lessons in a private school in Pakistan. Qualitative research methodologies were employed to see the impact of learning design on knowledge transfer of students when similar technologies are used at the same grade level but the learning designs are different. The results revealed that knowledge transfer depends on learning design in technology integrated lessons where limited technologies are available. In third world countries like Pakistan the concept of technology integration in schools is relatively new and the schools do not have access to sophisticated online learning environments like agent based learning or environments where in built scaffolds are provided to students. So technologies like Microsoft office, videos, digital cameras and projector are being used in private schools to improve the teaching and learning experience of students and learning design plays a very important role in knowledge transfer.

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Keywords: Instructional design; meaning integration of technology; learning technological skills

1. Introduction

In this paper learning design is used as a general term and it refers to Instructional Design or Instructional Systems Design. According to Reigeluth (1983) instructional Design includes "optimal methods of instruction to bring about desired changes in student knowledge and skills" (p.4) and he distinguishes instructional design from instructional development which is concerned with the practical application of the design in a particular setting. In this paper the definition by Dick, Carey and Carey (2005) will be used for Instructional Design and learning design where they link Instructional Design with Instructional Development and use instructional design as the "umbrella term" (p.3) that encompasses both the design and the practical application of that design.

The initiative of technology integration has started in some private schools in Pakistan. The concept of meaningful learning with technology where technology is used as a tool that learners learn with (Jonassen et al., 2008) is not clear to all instructional designers in Pakistan. So in certain schools the Instructional Design or learning design of lessons and projects in which technology is integrated focuses on teaching technological skills to the students and the integration of a particular subject is done in a step by step manner by students. However, where the concept of using technology as a tool is clear to curriculum designers meaningful learning is designed using the same technologies.

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Instructional Design or learning design is particularly important for developing countries where sophisticated learning designs or instructional technology environments like agent based learning environments, game based learning, learning simulations and virtual worlds are not accessible to students in elementary and middle schools because of the cost involved, the limited availability of technological resources and the lack of basic infrastructure to support such learning environments. In sophisticated learning environments explained above learning design of the learning environments is designed in such a way that students construct knowledge as they navigate that particular learning environment. However this is not the case where learning design has to be designed by the teacher with limited technologies, therefore, educators in developing countries need to share their experiences of meaningful learning with the available technologies so that other educators can use the same approaches to enhance student learning. This paper specifically would present how learning design or instructional design can impact student learning even though the same technologies are used.

2. Literature review

When elaborating on Instructional System Design, Dick (1995, p.13) says that at the most general level, "it is a process of determining what to teach and how to teach it". The goal of instructional design, according to Dick, is to add in the gaps which are there because of deficiencies in knowledge and skill. According to this definition instructional design has a prescriptive goal as it will fulfill specific needs in specific contexts (Reigeluth, 1983).

However, the foremost goal of educational technology or of integrating technologies is to improve educational practice. One way in which educational technology can improve educational practice is through design of innovative interventions (Reeves, 2006).

One view about technology is that the mere presence of technology in schools will improve student learning and the other view is that money spent on technology and time spent by students in using technology is a waste of money and time. The effect of technology on learning has been reviewed by many groups and they have reached the conclusion that computers and related technologies have the potential to improve student learning but only if they are used appropriately (Cognition and Technology Group at Vanderbilt, 1996; President's Committee of Advisors on Science and Technology, 1997, as cited in Wiggins & McTighe, 1998; Dede, 1998).

Jonassen et al. (2008) has explained that meaningful learning with technology entails keeping in perspective the constructivist approach to learning. According to Jonassen, technology can be used for meaningful learning if it is used as a tool that supports knowledge construction. It can also be used as "information vehicle for exploring knowledge to support knowledge construction" (p. 7). Technology can also be an intellectual partner that supports learning if it helps the learners to reflect on what they have learned and lets them construct personal representations of meanings. The five characteristics of meaningful learning that are elaborated by Jonassen et al. (2008) are that the task that students get involved should engage students in active, constructive, intentional, authentic and cooperative activities (p.2).

All uses of computer**s** are not compatible with constructivist thinking such as the use of computers as workbooks, where the students are not allowed to manipulate or change the information, but simply have to choose the right answer (Brown & Campione, 1996). Some other uses of technology are when computers are being used to administer standardized tests. The important change with or without technology is to bring a change in the teaching and learning methodology as advocated by Papert (1996). So the use of technology has to be clearly understood by the instructional designers so that technology is not just used to fill in the gaps of knowledge but it is used in a constructive way to help construction of knowledge by students based on the five characteristics of meaningful learning.

3. Methodology

Qualitative research methodologies were used to collect data for this study. Documentary analysis, class room observations and semi structured interviews were used to collect data. In order to analyze the learning design of lessons, lesson plans were reviewed to understand the learning design used. Observation of lessons was done by the researcher and in certain instances where the researcher was unable to observe the lesson herself feedback was taken from the teacher and/or the video of the lesson being conducted was observed. Information was taken from the

instructional designers of technology integrated lessons through semi-structured interviews to understand their perspective of meaningful integration of technology.

4. Results and discussion

In this study the impact of learning design is seen on student learning in lessons where technology is integrated in the teaching of different subjects. A comparison of eight lessons is done where similar technologies are used in teaching and learning at the same grade level but the learning designs are different. There are two parts of discussion of learning designs: the first part is on learning technological skills and the second part is on meaningful learning. The integration of technology in different subjects is done in both learning designs.

4.1. Learning designs focusing on learning technological skills

As already mentioned data was collected through documentary analysis, observations and semi structured interviews. Discussion will focus on data collected through the three ways mentioned above.

Documentary Analysis of the lesson plans revealed that the learning design of lessons which were focusing on teaching technological skill to the student, started by teaching the particular technological skill to the students. The skills are taught in a step by step manner and after teaching the skill, integration is also done in a step by step manner. Three examples of the technological skills and integration are in the table listed below:

Table 1. Examples of Integration of Technology with a Focus on Learning Technology Skill

Topic and Grade Level	Technology Skill	Integration with the Subject
Grade 4: English and Black Cat Write Away (A software which works like MS Word)	Learn how to make headings bold, italic and underline it. Change the headings into different font sizes.	In integration with English, students will open one document which is saved in their My Documents folder as Exercise- 1.Then students will make the headings bold, italic and underlined in that document following the steps in the book.
Grade 5: Science and Excel: Analyzing Data and Answering Questions	Students will learn how to open the data in MS Excel; how to arrange it in alphabetical order and how to edit it.	Students will open a file in MS Excel which is saved in My Documents folder. Students will sort the data in alphabetical order; delete the record of Pluto as it is not considered a planet; add the information about Uranus from another file instead of Pluto.
Grade 6: Mathematics and Excel	Students will learn about the standard tool bar of excel and the formatting toolbar. Students will learn how to merge cells, split merge cells, apply/remove cell borders and customize charts.	Students will load Microsoft Excel and then open Exercise 1 from My Documents. Then students will rename sheet 2 to 2008; apply different colors for amount in between different numbers. The steps will continue in the exercise to be followed by the students.

The observation of students in the classes showed that the students learned the technology skill to be taught by following the steps in the book. If the Exercise contained step by step information about Science then integration was done with Science and if the Exercise contained information relating to numbers or English then the integration was done with that particular subject.

The semi-structured interview of instructional designers showed that the instructional designer was very happy with the learning that was taking place with the integration of technology. She emphasized that all the subjects were being integrated with technology and that all the students were learning the same thing with technology. According to the instructional designer the best aspect of integration was that integration was done with all the subjects and the students were given opportunities to practice the technological skill that they had learned.

4.2. Learning designs focusing on meaningful learning with technology

For learning designs focusing on meaningful learning with technology discussion will focus on the discussion of data collected through documentary analysis, observations and semi-structured interviews. As already mentioned in the Methodology section, in certain instances where observation could not be done by the researcher, the researcher collected data from the video of the lesson, or feedback was taken from the teacher conducting the lesson.

Documentary analysis of the lesson plans revealed that the focus of the learning design is on meaningful learning with technology and students learned the technological skill because it was going to be integrated in the learning of a particular subject. There was a section on Meaningful Learning with Technology in every lesson plan which delineated how the use of technology was leading to meaningful learning and the 21st century skills being learned were also included in a separate section in the lesson plans. Three examples of meaningful learning and the technological skill being learned are given in the table listed below:

Table 2. Examples of integration of technology with a focus on meaningful learning

Topic and Grade Level	Technology Skill	Integration with the Subject
Grade 4: English and MS Word	Students will learn how to write a report in MS Word. While writing they will learn the different features of MS Word as they explore it based on the requirements of their writing assignment.	4.1.1. Students will work in groups and will be assigned one topic from their culture to write a report so that it can be shared by the teacher with e-pals living in US. Students can share a report on religious festival; celebration of a particular historical day; or cultural recipes.
Grade 5: Science and MS Excel	Learn how to make a timeline in Microsoft Excel.	Students will research famous scientific experiments from ancient times to the present and record the information in Microsoft Excel Timeline in groups. After the timeline students will write a report outlining the steps of the scientific method taken by the scientist individually. Students will present their timelines to the class in groups and discuss the differences among them.
Grade 6: Mathematics and Excel	Students will learn how to enter data in excel and record outcomes. Students will learn how to analyse the data recorded in excel.	Students will start a small business in school and they will use excel sheet to record data for the expenditures and the profit/loss made. Students will analyse the profit and loss and write a strategy report on how to run a successful business.

The observation of the lessons or the videos of the lessons or the feedback of the teacher revealed that students worked in groups or individually while using technology as a tool to learn about the particular subject in which technology was integrated. Students learned about the technological skill right before they were going to use it in the

learning of a particular subject so the focus of the learning design was not on learning a technological skill but on improving the learning of students in that particular topic. Learning was not done in a step by step manner and the learning outcome varied between students and groups of students.

The semi-structured interviews of instructional designers highlighted the importance of meaningful learning while incorporating different technologies in the teaching of subjects. It was stressed that the main focus of integrating technology in any lesson is to make sure that it leads to meaningful learning by students. They also mentioned that students will learn the technological skill while they are integrating technology and that will make the learning of that skill meaningful for students.

5. Conclusion

From the findings it can be inferred that the learning design of technology integrated lessons differed in their approach to the integration of technology in different subjects. The lessons in which the instructional designer focused on teaching a particular technology skill to the students like MS Word or MS Excel, integration was done to reinforce the technological skill being learned. So students demonstrated their knowledge of Word or Excel by following the steps assigned in the lesson and meaningful learning with technology did not take place in these lessons. Whereas in lessons where the focus of the instructional designer is on meaningful learning with technology, technological skill was learned to achieve the learning objectives of that particular subject. In these lessons students engaged in meaningful learning experiences by getting involved in active, intentional, authentic, constructive and cooperative learning (Jonassen et al.,2008) while using technology. Technological skill was not taught in a step by step manner and neither was integration done in a step by step manner in these lessons.

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